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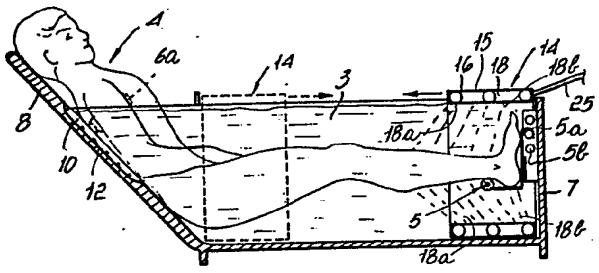
(54) Hydromassage device, particularly for pressotherapy.

(57) This invention relates to a hydromassage device (1) particularly for peristaltic action pressotherapy comprising a tank (2) containing a liquid (3) provided with means of treating a patient (4) suspended in the cited liquid (3), means (12, 14, 18–18b) of intermittently dispensing a fluid under pressure translating internally or along the tank (2) adapted to generate a continuous peristaltic wave in said liquid (3) for stimulating the blood and lymphatic flow of the patient's (4) body parts.



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"HYDROMASSAGE DEVICE, PARTICULARLY FOR PRESSOTHERAPY"

The present invention relates to a hydromassage device particularly adapted to provoke a peristaltic pressotherapeutic action. As is known, to avoid the accumulation of metabolic waste products, i.e. building up waste substances of cell metabolism stagnating in a situation of hyperemia or disequilibrium of the mechanism of arterial osmotic, and oncotic pressures which fully control the biological exchange at the level of the dermis and subdermis tissues, and which are the cause of cellulitis formation, widely employed nowadays, and with reason, are local physiotherapeutic treatments of which there are essentially four types: mesotherapy, iontophoresis, laser applications, and peristaltic action sectorized pneumopressotherapy. In particular of the four types of treatment, peristaltic action sectorized pneumopressotherapy is the safest and most painless technique and above all enables each individual part of patient's body to be acted upon which is affected by lympho-venous hyperemia and consequent formation of cellulitis, i.e. leg, thigh, hips, and abdomen, to allow re-absorption of the liquid built up in the tissues by the lymphatic and venous vessels. In addition to manual massages, as still practiced today, commercially available are devices for application to the body part to be treated which, while having the advantage of eliminating manual intervention, involve that they can only be applied to a determined region of the patient's body, sometimes causing, being in direct contact with the

epithelial tissue annoyance of irritating allergies or ecchymosis or regions of poor distribution of the pressures, i.e. unevenly treated regions.

In order to overcome such shortcomings sometimes used for applying massages are hydromassage tanks into which a pressurized fluid is introduced which creates a turbolent flow in the liquid contained in the tank which is adapted to massage the patient's body.

However, this massage is unsuited to cause continuously and uniformly distributed stimulation over the person's body owing to non-optimization of the streamlines in the generated fluid currents which effect the massage over the various parts of the body to be treated, and which should observe instead the physiological lines of the lympho-venous reflow circulation.

It is the aim of this invention to eliminate the above mentioned drawbacks by providing a hydromassage device which can especially favor a peristaltic action sectorized pressotherapy which enables stimulation of the lymphatic and blood flow of a patient over a broad region of the body to affect, in a continuous and progressive manner, the whole surface to be treated, thus encouraging mobility and consequent re-absorption and physiological elimination of waste and liquids as present in the intercellular spaces.

Within the above aim, it is an important object of the invention to provide a modulable and customizable device adapted to generate a peristaltic wave which

causes in the soaked connective tissue a pressure which favors oncotic depression, thus enabling the liquids to be absorbed back into the venous blood vessels and lymphatic system.

A not least object of the invention is to provide a device which by not being in direct contact with the epithelical tissue of the patient will cause him/her no annoying irritations, nor any partial or decompensated compressions.

The above aim, as well as these and other objects, are achieved by a hydromassage device particularly useful in pressotherapy, characterized in that it comprises: a tank containing a liquid, means of holding a patient suspended in said liquid, means for the intermittent distribution of a fluid under pressure, also when said fluid is admixed to others, translating internally along said tank and adapted to generate a continuous peristaltic wave in said liquid for the stimulation of the blood and lymphatic flow in the affected parts of the body of said patient and hence revitalize both the tissue metabolism of soft tissue of the subcutaneous layer and, by inducement effect also the tissue of the osteo-ligamentary system.

Further features and avantages of the invention will be more clearly apparent from the description of a preferred but not exclusive embodiment of the device according to the invention as illustrated by way of example and not of limitation in the accompanying drawings where:

Figure 1 is a perspective view of the pressotherapeutic hydromassage tank according to the invention;

Figure 2 is a sectional side elevation view of the tank according to the invention shown in Figure 1;

Figure 3 is a sectional front elevation view showing the means of intermittently dispensing a fluid according to the invention;

Figure 4 is a sectional view of a particular embodiment of the nozzles ejecting the pressurized fluid;

Figure 5 is a detail view of Figure 2 showing the action of the peristaltic wave over a segment of the patient's body;

Figure 6 is a detail view of the backrest of the tank according to the invention;

Figure 7 is a sectional, front elevation view showing the fluid jets against the lower limbs of the patient according to the invention;

Figure 8 is a sectional view along the longitudinal axis of a further embodiment of the tank according to the invention;

Figure 9 is a sectional view along the longitudinal axis of the tank according to a modified embodiment of the invention, with an oscillably moving element;

Figure 10 is a detail view of the tank of Figure 2 showing the operation of ultrasonic generators therein according to the invention;

Figure 11 is a plan view of the ultrasonic tank according to the invention; and

Figure 12 is a sectional view on the longitudinal

axis of the ultrasonic tank according to the invention.

With particular reference to the drawing figures, the device according to the invention, as generally designated with the reference numeral 1, comprises a tank 2 containing a liquid 3 wherein the patient is immersed.

The hydromassage device further comprises means for supporting a patient generally designated with the reference numeral 4 immersed in said fluid, said means comprising a supporting element 5 for the lower limbs and a pair of identical armrests or arms 6a and 6b adapted for placement under a patient's armpits for supporting the patient's trunk in cooperation with the backrest 8. More precisely the supporting element 5 is accomodated at a middle portion of the surface of the wall 7 of the tank 2, which is laid opposite to a sloping wall 8 to permit the patient to assume a semi-prone posture.

Moreover, the supporting element 5 is advantageously positionable at different heights on the wall 7 by means of hooks 5a, associated with the supporting element 5, for engaging one of a plurality of horizontal bars 5b arranged at different heights on said wall 7 to accomodate the build of the patient 4, or, said supporting element 5 may be housed in a portion of a translating element 15 and configured to slide without particular frictional resistance over and under the lower limbs of the patient.

The sloping wall 8 comprises two pluralities of sockets indicated at 9a, 9b into a pair of which, lying on a common horizontal line the arms 6a and 6b are

inserted, again in accordance with the patient's build.

Provided on the middle surface of the sloping wall or backrest 8 is a depressed area 10 expediently located equidistantly from the two rows of sockets 9a, 9b so as to extend along the length of the patient's spine. The depressed area 10 has means of dispensing pressurized fluid comprising a plurality of nozzles 12 which advantageously act to dispense the cited fluid under pressure in an upward inclined direction at approximately 45° relatively to the sloping wall 8 and hence the patient's 4 back. These jets are activated from the bottom towards the top consecutively at successive preset times. On opening the upper jet, the lower one may be either left on or shut off. Otherwise, on completing the bottom up cycle at the number of nozzles housed in the depressed area of the backrest, all the nozzles will be shut off before re-starting, from above down, the number of nozzles being determined each time in relation to the objective requirement of the patient. Thus in this way, another wave thrust is accomplished which extends from the back zone at the base of the patients neck to then move down partly as far as about the half-length of the patient's back.

For completeness of illustration it should be noted that the cited means for dispensing fluid under pressure further comprise an upper nozzle 13 adapted to emit pressurized fluid in a substantially downward sloping direction with respect to the patient's back in an intermittent jet as delivered by each of the nozzles 12.

The means for intermittently dispensing the

pressurized fluid indicated generally at 14 in the instance under consideration comprise a reciprocating element 15 having an outer surface 16 and inner surface 17 coaxial with each other and extending in a form substantially shaped with an anatomical-wrap-around shape defining a space 18 therebetween.

The space 18 accomodates on its interior a first plurality of nozzles 18a delivering the fluid under pressure in substantially inclined directions on the direction of reciprocation of said reciprocating element as indicated by the numeral 19 in Figure 5 and a second plurality of nozzles 18b delivering the cited fluid under pressure in a substantially vertical direction 20 with respect to the direction of reciprocation of the reciprocating element 15.

It should also be pointed out that advantageously the second nozzle plurality, prior to reciprocation of the reciprocating element 15, are close to the supporting element 5, for the lower limbs of the patient 4.

The reciprocating element 15 is peripherally provided with two pairs of rollers 22a and 22b each being pivotally mounted for movement along guides 23a, 23b placed on each side of the tank 2 or with a reciprocating element system of support connected to hydraulic, pneumatic, or oil-operated pistons.

More precisely the roller pairs 22a, 22b are protected by a case 24, shown in dash lines in Figure 1 to prevent them from presenting any danger of injury to the patient during the reciprocation of the reciprocating element.

It should be also noted that both the first 18a and second 18b pluralities of nozzles are recessed under the plane of the inner surface 17 as shown in Figure 7 such as to cause no abrasion to the patient 4 during reciprocation of the reciprocating element 15 over the patient's body.

The nozzles 18a, 18b of the reciprocating element 15 and the nozzles 12, 13 of the backrest 8 are then connected through tubing 25 to a pump or compressor which allow for the delivery of the fluid under pressure, through the nozzles 12, 13, 18a, 18b.

The translation of the reciprocating element 15 is accomplished via a device of a known type accommodated within a box-like body 26 placed externally to the tank 2.

According to a modified embodiment, the reciprocating element 15 may be replaced with an element set for oscillation about a horizontal pivot axis, being also equipped with nozzles to generate a peristaltic wave according to the invention.

As shown in Figure 9, the structure according to a modified embodiment of the invention comprises an oscillably moving element 107 which is supported on the tank walls and adapted to oscillate about a substantially horizontal axis. The oscillably moving element 107 has one portion of its surface occupied by nozzles 106c. Of course, this portion would be at all times held immersed in the liquid as the oscillably moving element 107 is being oscillated.

The nozzles 106c carried on the oscillably moving

element 107, which form another part of the means of intermittently dispensing fluid under pressure according to the invention, are connected to the feed pumps by a pipe 108.

In a further modified embodiment, intermittent dispensing of fluid under pressure translating through the tank interior may be accomplished, rather than by the translating element on which a plurality of nozzles (fed from one or more sources) are formed, by a plurality of fixed nozzles 106b arranged to be aligned along the tank walls, which nozzles are fed in succession thereby each nozzle will deliver the pressure wave according to a preset program creating an effect of movement of such a pressure wave along the extension of the tank from one nozzle (or set of nozzles) to the next.

According to a further embodiment of the invention, the nozzles 106b (Figure 8) are arranged in mutually parallel rows across the side walls and bottom wall of the tank so as to span the skin surface of the patient to be subjected to the treatment, in this case the legs, thighs, and part of the sides, at an inclination of substantially 45° to the top portions of the patient.

The means utilized to create the pulsating pressure effect on the liquid in the tank may not only be a fluid, as shown in the examples described so far, but any different source of pulses.

As an example, pulses may be provided by ultrasonic waves, in which case, of course, ultrasonic emitters would be provided instead of nozzles as in the various approaches indicated hereinabove.

For completeness of illustration, it should be mentioned that all the ultrasonic generators are housed below surfaces whereto they are attached so as to cause no inconvenience for the patient in the event of accidental shocks during the treatment.

The patient is introduced into the tank and held up by means of the buoyant belt 219, supporting element 217, and a rotatable roller 220 carried transversely on the linearly translating element.

At this point, the treatment is started, i.e. operated sequentially at preset times from below are the ultrasonic generators 207a which are located at the recessed area of the sloping backrest. On completion of the upward cycle all the ultrasonic generators of the recessed area are deactivated to be reactivated downwards. In this way, an important wave thrust is achieved which from the back reaches the neck base to then move again partly down to the hip region of the patient.

While the ultrasonic generators 207a operate as described, the generators 207b are activated which are carried on the linearly translating element 208 which simultaneously begins to translate along the guides 220a and 220b.

Thus, a peristaltic wave is generated which sweeps progressively across the lower limbs of the patient by virtue of the inclined direction of propagation of the waves issuing from the first plurality of ultrasonic generators. The second plurality of ultrasonic generators, having a substantially perpendicular

direction of propagation to the skin surface of the patient, prevent the lymphatic and blood liquid from backflowing before the treatment has been completed.

The ultrasonic generators 207c carried on the side walls and bottom wall of the tank are operated in succession to create a peristaltic wave which moves from the lower limbs of the patient up to the sides thereof.

The ultrasonic generators 207d achieve the same effect by the movement of the oscillably translating element whereto they are linked, and afford the faculty of being operated either during the forward half-swing or return half-swing thereof.

It has been found in practice that the structure of this invention provides a modulable peristaltic technique according to the patient's conditions.

Another advantage of the structure of this invention is that of providing a simplification in the partialization of the treatment because it is possible to separately connect many more ultrasonic generator sets to a single computer which determines the number of the generators to be activated in conformity with a customized card of the patient.

The operation of the inventive device is quite apparent from the foregoing description and illustration and in particular with reference to Figures 2 and 5 it may be seen that once the patient has entered the tank 2 containing a selected amount of liquid and taken place such as to be suspended owing to the presence of the supporting element 5 and arms 6a and 6b, the reciprocable element 15 will act through the nozzles arranged

helically within the space 18 to reciprocate, being driven by a motor accommodated on the exterior of the tank isolated from liquid seepage, arranged for movement along the guides 23a, 23b or pistons corresponding with respect to the surface of the body of the patient such that the latter is fully subjected to an upward stream in a continuous and progressive fashion generating a peristaltic wave obtained by virtue of the substantially 45° inclination of the liquid jet from the nozzles. It is also to be considered, that, the substantially vertical jet of liquid exiting the second plurality of nozzles 18b will prevent a backflow of lymphatic and blood liquid until completion of the treatment over the entire surface of the patient's body effected by the treatment. It has been found in actual practice that the device of this invention is specially advantageous in affording a modulable segmental peristaltic technique by means of a customized card compiled to reflect the subjective physical conditions of the patient, i.e. a safe and painless technique which acts in a uniform progressive manner over the entire surface of the part of the patient's body to be treated allowing for re-absorption of the liquids into the blood and lymphatic vessels.

CLAIMS

1. A hydromassage device (1) particularly for pressotherapy, characterized in that it comprises a bath tube-like tank (2) means for containing a liquid (3), means (5,5a,5b,6a,6b,9a,9b,219,220) for holding a patient (4) at least partially suspended in said liquid (3), and fluid dispensing means (12,13,14-19,106b,106c,207a-207d) for continuously or preferably intermittently dispensing a fluid to flow or circulate internally along said tank (2) and adapted to generate at least in part a peristaltic-like wave or circulation in or through said liquid (3) to stimulate the blood and lymphatic flow of the patient's (4) body parts subjected to treatment.

2. A device according to Claim 1, characterized in that said fluid dispensing means (12,13,14-19,106b,106c,207a-207d) comprise pressurized fluid delivery (12,13,14-19,106b) and/or ultrasonic emitter nozzles (106c,207a-107d).

3. A device according to Claim 1, characterized in that said means for holding a patient at least partially suspended in said liquid comprise a lower limb supporting element (5,5a,5b) housed in a middle portion of the surface of one wall (7) of said tank (2) juxtaposed to a sloping wall (8) having a plurality of seats (9a,9b) therein which are adapted to receive a pair of armrests (6a,6b) for supporting the trunk of said patient (4).

4. A device according to Claim 3, characterized in that said supporting element (5,5a,5b) and said pair of armrests (6a,6b) are located respectively on said wall

(7) and said sloping wall (8) in conformity with the patient's (4) build.

5. A device according to Claim 1 and 3, characterized in that said fluid dispensing means (12,13,207a) are carried on a recessed area (10) provided at a middle portion of said sloping wall (8) and/or on a moveable element (15,107,207) moving along said tank (2) and/or on the side walls of said tank (2).

6. A device according to Claim 5, characterized in that said moveable element comprises a translatable element (15,207) adapted for movement along the longitudinal axis of said tank (2) and extending around the lower limbs of said patient (4), on the inside surface of said translatable element (15,207) there being provided a first plurality of said fluid dispensing means (18a) oriented in a delivery direction sloping substantially at 45° on the skin surface of said lower limbs and/or a second plurality of said fluid dispensing means (18b) oriented in a substantially perpendicular direction of delivery to the skin surface of said lower limbs.

7. A device according to Claim 5, characterized in that said moveable element comprises an oscillable element (107) adapted to oscillate about a substantially horizontal and transverse axis to the longitudinal axis of said tank (2) with at least one portion of its surface carrying said fluid dispensing means (196c) immersed in said liquid (3) in said tank (2).

8. A device according to Claim 5, characterized in that at least some of said fluid dispensing means (106b)

carried on the side walls of said tank (2) have a delivery direction sloping substantially at 45° to the skin surface of said patient (4).

9. A device according to Claim 5, characterized in that said fluid dispensing means (106b) carried on the side walls of said tank (2) are operated intermittently in succession.

10. A device according to Claim 1 or 5, characterized in that said recessed area (10) of the tank (2) accommodates on opposite sides with respect to the longitudinal axis of said tank (2) parallel rows of said fluid dispensing means (12,13) acting on regions contiguous to the spine of said patient (4).

11. A device according to Claims 5 and 10, characterized in that at least some of said fluid dispensing means (12) carried on said recessed area (10) of the sloping wall (8) of said tank (2) have a delivery direction inclined upwards substantially at 45° with respect to the skin surface of said patient (4) confronting said recessed area (10).

12. A device according to Claims 5 and 10, characterized in that at least some of said fluid dispensing means (13) carried on the recessed area (10) have a delivery direction sloping substantially downwards with respect to the skin surface of said patient (4) confronting said recessed area (10).

13. A device according to Claim 1, characterized in that said means for holding said patient (4) at least partially suspended in said liquid (3) comprise a buoyant belt (219) adjustable in conformity with the

build of said patient (4) and being connected at its ends to a sloping wall (8) of said tank (2) supporting the trunk of said patient (4).

14. A device according to one or more of the preceding Claims, characterized in that said means for holding said patient (4) at least partially suspended in said liquid (3) comprise a supporting element (220) for the lower limbs associated with said moveable element (15) and adapted to be slid at a reduced friction under said lower limbs and provide support therefor.

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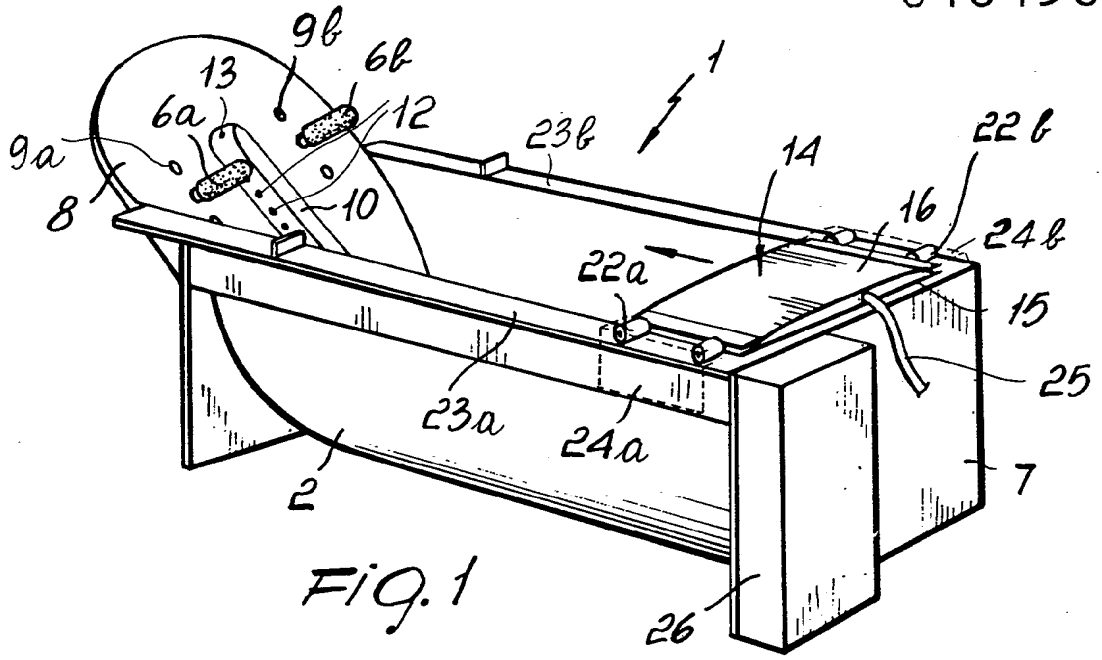

Fig. 1

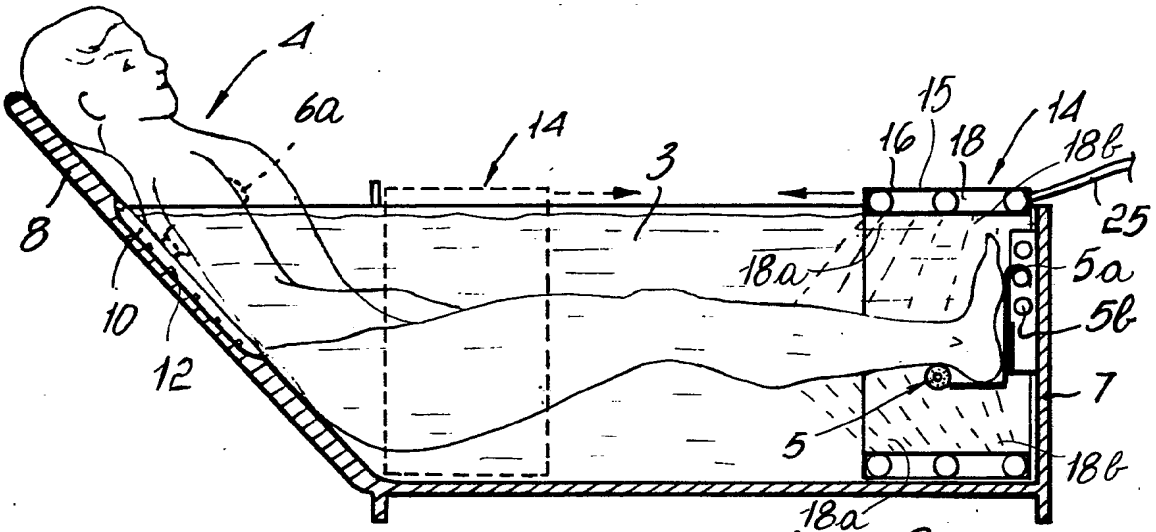

Fig. 2

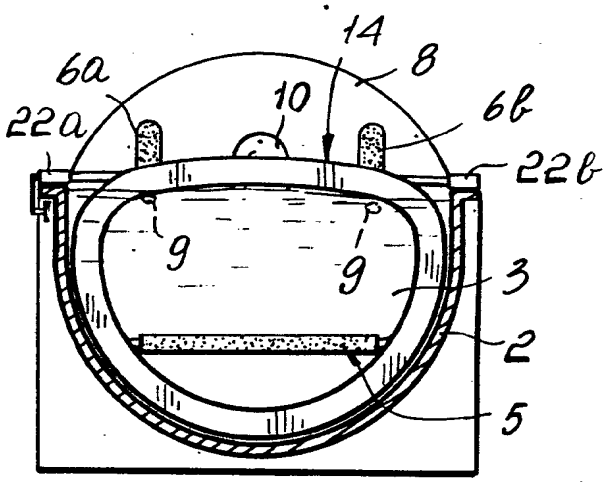

Fig. 3

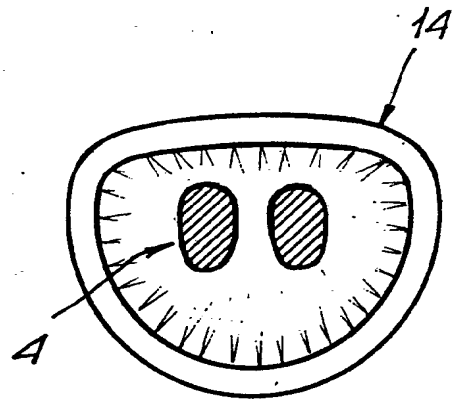

Fig. 4

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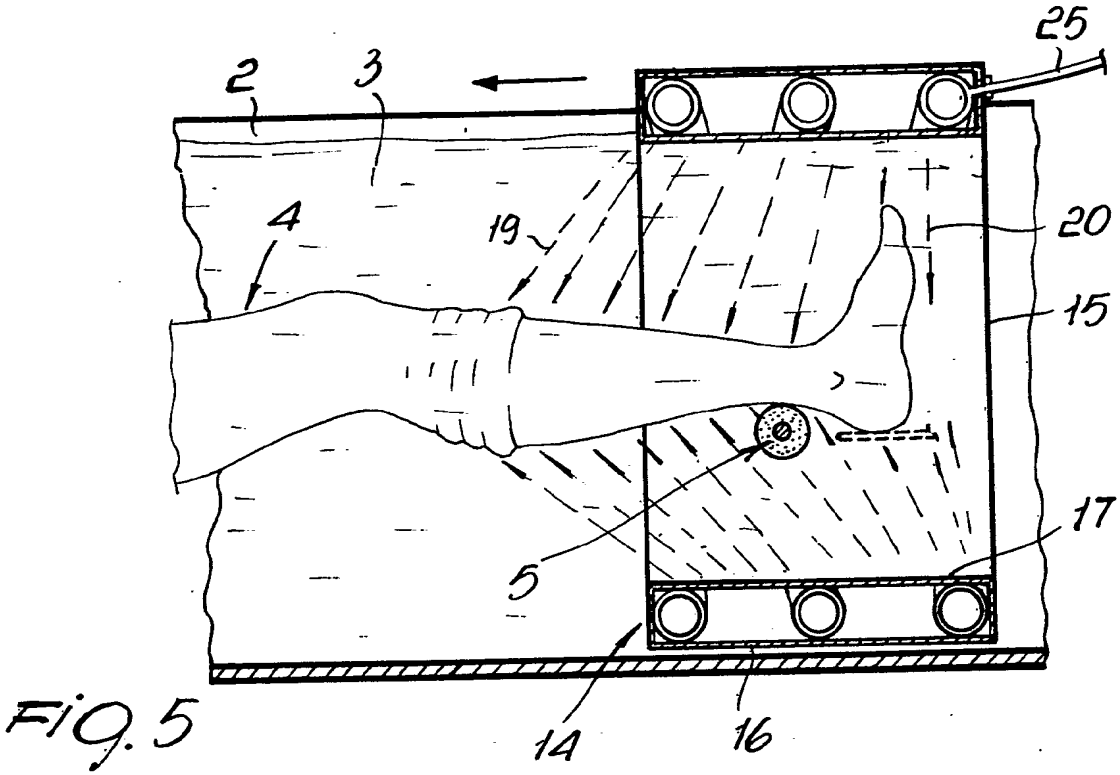

FIG. 5

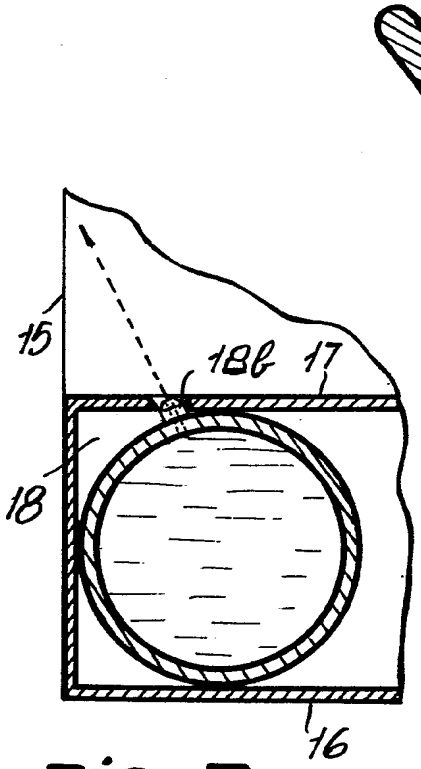

FIG. 7

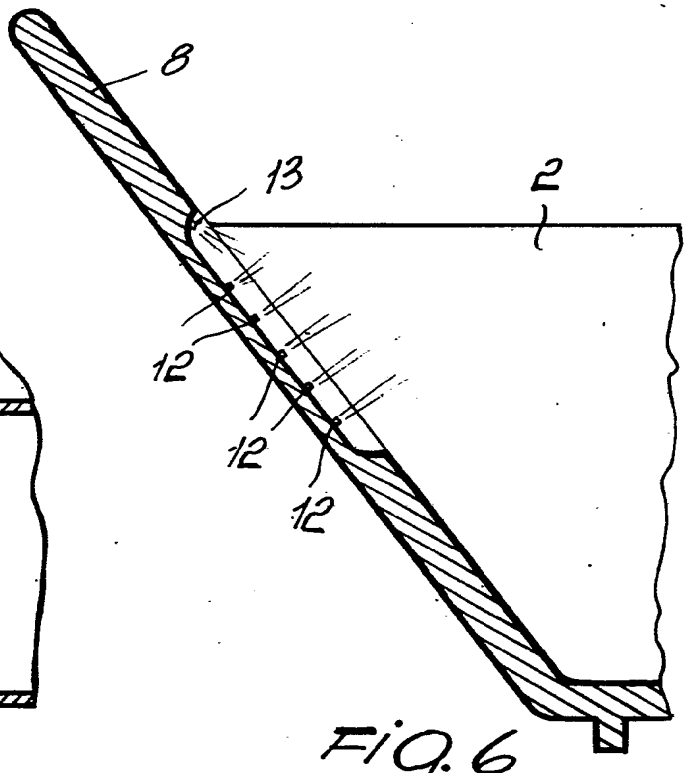

FIG. 6

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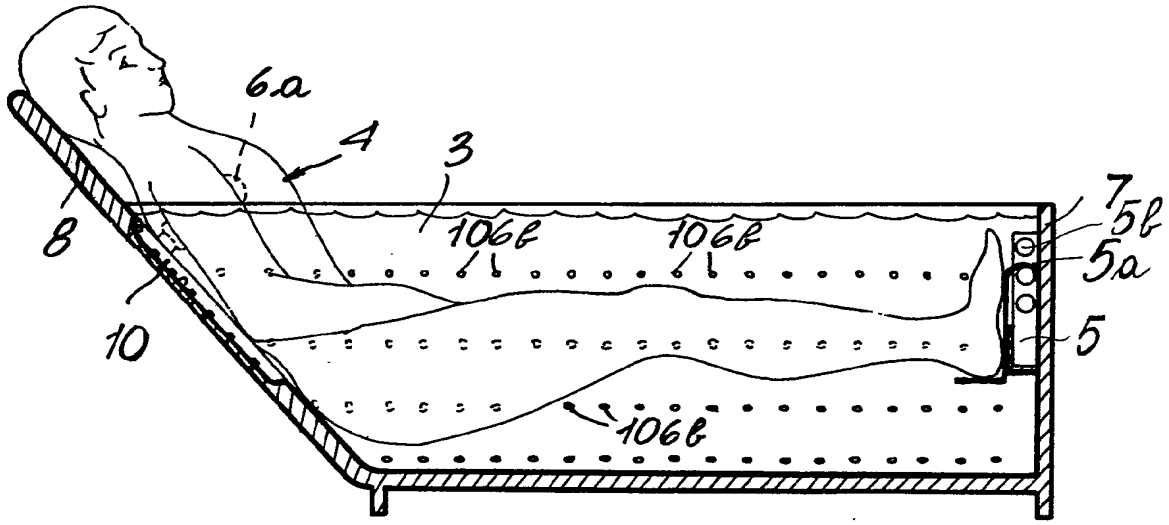

Fig. 8

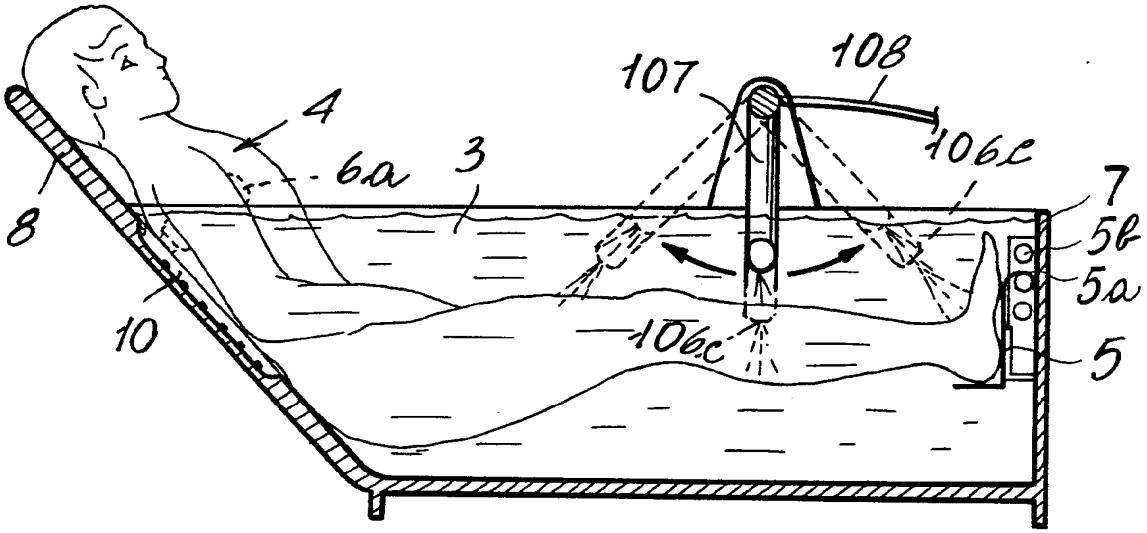

Fig. 9

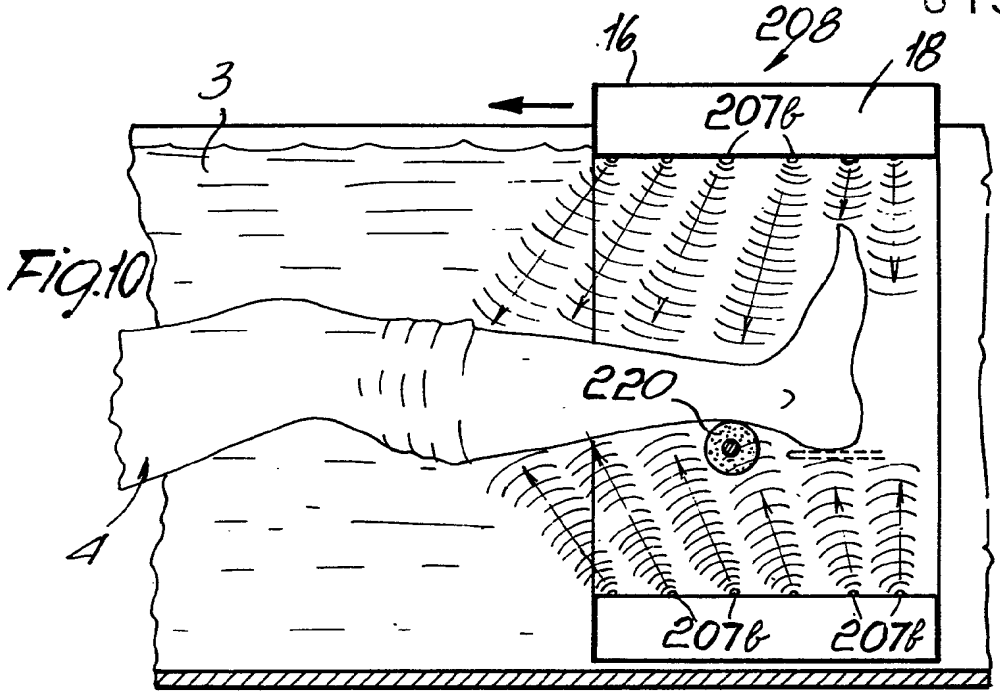

Fig.10

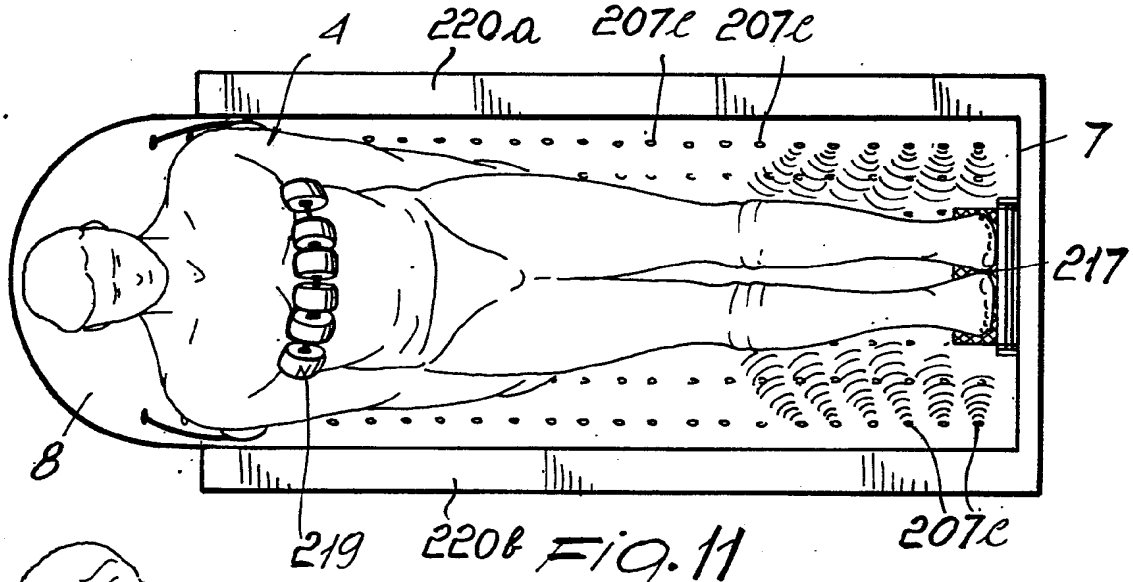

Fig. 11

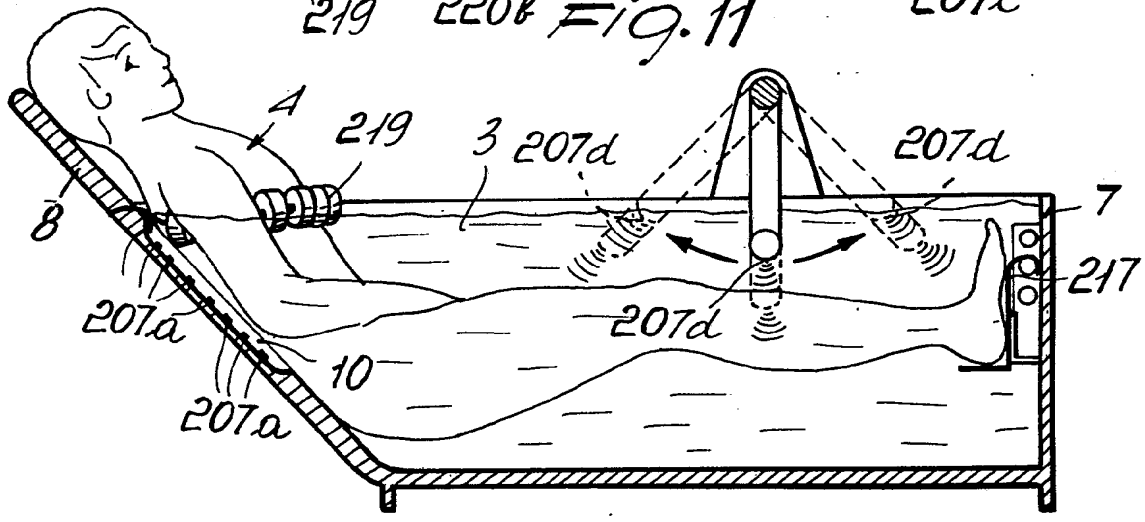

Fig. 12